CLAIMS

What is claimed is:

1. A method, comprising:

microbending a fiber Bragg grating with a transverse acoustic wave; and

reflecting one or more Nth order sidebands of reflection wavelengths with the fiber Bragg grating to couple a band of wavelengths within an optical signal from a first mode to a second mode.

2. The method of claim 1, further comprising:

generating the traverse acoustic wave at a first frequency and a first signal strength; and

transmitting the transverse acoustic wave to an optical waveguide having an interaction region containing the fiber Bragg grating.

3. The method of claim 1, further comprising:

separating the optical signal traveling in a first direction into a forward optical signal and a reflected optical signal;

routing the reflected optical signal into another optical component; and

transmitting the transverse acoustic wave to route the reflected optical signal.

4. The method of claim 1, further comprising:

separating the optical signal containing an optical spectrum of wavelengths traveling in a first direction into a forward optical signal and a reflected optical signal;

spectrally shaping the forward optical signal by selectively removing one or more portions of the optical spectrum contained in the optical signal; and

transmitting the transverse acoustic wave to spectrally shape the forward optical signal.

5. The method of claim 1, wherein the Nth order sidebands of reflection wavelengths comprises a first order sidebands of reflection wavelengths.

6. The method of claim 1, wherein the first mode comprises a core mode.

7. The method of claim 1, wherein the first mode comprises a cladding mode.

8. The method of claim 1, wherein the first mode comprises a polarization mode.

9. The method of claim 1, wherein coupling comprises transitioning energy from a first spatial propagation mode to a second spatial propagation mode.

10. The method of claim 1, wherein microbending comprises approximately simultaneously compressing a first portion of the fiber Bragg grating and straining a second portion of the fiber Bragg grating.

11. The method of claim 2, wherein wavelength spacing of the Nth order sidebands of reflection wavelengths is proportional to the first frequency of the transverse acoustic wave.

12. The method of claim 2, wherein a percentage of the Nth order sidebands of reflected wavelengths coupled from the first mode to the second mode corresponds to the first signal strength of the acoustic wave.

13. An apparatus, comprising:

an optical waveguide having an interaction region containing a fiber Bragg grating, a cladding, and a core offset in respect to the cladding; and

an acoustic wave exciter affixed to the interaction region, the acoustic wave exciter to generate an acoustic wave along the interaction region.

14. The apparatus of claim 13, wherein the fiber Bragg grating is in the core, the core having a center, and the center of the core is offset in relation to a center of the cladding.

15. The apparatus of claim 13, wherein the optical waveguide comprises an optical fiber.

16. The apparatus of claim 13, wherein the fiber Bragg grating is continuous from a first portion to a second portion.

17. The apparatus of claim 13, wherein the fiber Bragg grating includes a first portion and a second portion, the first portion is discrete from the second portion and an interruption of the fiber Bragg grating exists between the second potion and the first portion.

18. The apparatus of claim 13, wherein the acoustic wave exciter includes an acoustic wave amplifying member, a signal generator, and an acoustic wave generator.

19. The apparatus of claim 18, wherein the acoustic wave amplifying member comprises an acoustic horn.

20. The apparatus of claim 18, wherein the acoustic wave generator comprises a transducer.

21. The apparatus of claim 15, wherein the optical fiber comprises a single mode optical fiber.

22. The apparatus of claim 13, wherein the apparatus comprises an acoustical-optical tunable add module.

23. The apparatus of claim 13, wherein the apparatus comprises an acoustical-optical tunable drop module.

24. The apparatus of claim 13, wherein the apparatus comprises an acoustical-optical tunable gain-flattening module.

25. The apparatus of claim 13, wherein the acoustic wave exciter is tunable to select an Nth order sidebands of reflected wavelengths in an optical signal.

26. The apparatus of claim 13, further comprising:

an acoustic wave absorber affixed to the interaction region.

27. The apparatus of claim 26, further comprising:

a heat sink affixed to the acoustic wave absorber.

28. The apparatus of claim 13, wherein the optical waveguide further comprises a jacket surrounding the core and the cladding and the interaction region comprises a section of the optical waveguide where the jacket is removed.

29. The apparatus of claim 13, wherein the acoustic wave exciter generates a compressional acoustic wave.

30. The apparatus of claim 13, wherein the acoustic wave exciter generates a transverse acoustic wave.

31. An apparatus, comprising:

an optical waveguide having an interaction region containing a fiber Bragg grating to allow coupling between optical modes in the optical waveguide; and

an acoustic wave exciter affixed to the interaction region, the acoustic wave exciter to generate a transverse acoustic wave along the interaction region.

32. The apparatus of claim 31, wherein the optical waveguide contains a tapered region and the interaction region is located within the tapered region.

33. The apparatus of claim 31, wherein the acoustic wave exciter comprises one or more acoustic wave exciters cascaded in series along the optical waveguide.

34. An apparatus, comprising:

means for microbending a fiber Bragg grating with a transverse acoustic wave; and

means for reflecting one or more Nth order sidebands of reflection wavelengths with the fiber Bragg grating to couple a band of wavelengths within an optical signal from a first mode to a second mode.

35. The apparatus of claim 34, further comprising:

means for generating the traverse acoustic wave at a first frequency and a first signal strength; and

means for transmitting the transverse acoustic wave to an optical waveguide having an interaction region containing the fiber Bragg grating.

36. The apparatus of claim 34, further comprising:

means for separating the optical signal traveling in a first direction into a forward optical signal and a reflected optical signal;

means for routing the reflected optical signal into another optical component; and

means for transmitting the transverse acoustic wave to route the reflected optical signal.

37. The apparatus of claim 34, further comprising:

means for separating the optical signal containing an optical spectrum of wavelengths traveling in a first direction into a forward optical signal and a reflected optical signal;

means for spectrally shaping the forward optical signal by selectively removing one or more portions of the optical spectrum contained in the optical signal; and

means for transmitting the transverse acoustic wave to spectrally shape the forward optical signal.

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